

Metcalfe's Law Predicts Reduced Power of Electronic Medical Record Software

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Introduction: Error reduction, quality improvement and lowering of cost can all be achieved through electronic integration of health care providers. Despite the existence of clinical computing software for decades, meaningful linkage between health care providers has not occurred. We hypothesize that a major reason is reduction in network value through incompatible clinical software among hundreds of health care entities.

Methods: To test this hypothesis, we performed a secondary analysis of member survey data collected by the American Academy of Family Physicians (AAFP) in January 2003. The purpose of the survey was to measure interest in an AAFP-sponsored Electronic Health Record/Electronic Medical Record (EHR/EMR) service. The survey was conducted by e-mail invitation to all active AAFP members with an e-mail address (n=35,554). 5,517 responded for a response rate of 15.5%. This is comparable to response rates in other published on-line survey studies. We estimated the number of different software vendors reported by users of an EHR/EMR. We then applied Metcalfe's law to this number. Metcalfe's law states: the value of a network grows as the square of its number of users.

Results: The average age of respondents was 46 years, and 79% (n=4348) were men. . Of those responding, 1297 (23%) reported use of an EHR/EMR. The average age of these was 45 and 80% (n=1044) were men. 264 different EHR/EMR records were currently in use among the family physicians that responded to the survey. The largest single number of compatible users was 148. Application of Metcalfe's law yields a power of only 148^2 or 21904 for these aggregate systems when the potential power should be 1297^2 or 1,682,209 if all of these providers were linked. This is a 76.8-fold reduction in the potential power of these systems in this small sample of all AAFP members.

Conclusions: We found that the overall value of EHR/EMR among family physicians is greatly reduced by fragmentation into hundreds of incompatible systems. It is likely that our findings dramatically underestimate the true magnitude of this problem, because those with the greatest interest and use of EHR/EMR are those most likely to respond to this survey. The proliferation and benefits of an integrated healthcare delivery system will not be realized until a critical mass of uniformity is achieved. The hindrance to professional exchange of important clinical documentation and the use of EHR/EMR caused by this fragmentation could be mitigated through the tools and techniques available through Free and Open Source Software (FOSS).